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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN THE APPLICATION OF: KOLB ET AL.

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GROUP ART UNIT: 1764

TITLE: DISPERSANT VISCOSITY MODIFIERS BASED ON DIENE-CONTAINING
POLYMERS

Wickliffe, Ohio

Dated: October 22, 2007

Hon. Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

REMARKS

In a phone conversation today with Examiner Choi, it was determined that the claims before the examiner do not include the amendment made under PCT Rule 34. Accordingly, a copy of the amended claims is attached. It is noted that the amendments are not shown by the underlining and strike-through method, since this is not required in the PCT. The substance of the amendment was to introduce the subject matter of former claim 7 into the independent claims. Original claim 7 was deleted and the subsequent claims renumbered.

Any required fees or any deficiency or overpayment in fees should be charged or credited to deposit account 12-2275 (The Lubrizol Corporation).

Respectfully submitted,



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10/22/07
Date of Deposit

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Deposited by: David M. Shold

Case No. 3267-01

What is claimed is:

1. A composition comprising the reaction product of:
 - (a) an isobutylene-diene copolymer having an \overline{M}_n of about 1000 to about
5 150,000 and containing thereon an average of about 0.1 to 4 equivalents, per
each 1000 units of \overline{M}_n of the polymer, of carboxylic acid functionality or
reactive equivalent thereof, derived from at least one α,β -unsaturated carbox-
ylic compound; and
 - (b) an amine component comprising at least one aromatic amine contain-
10 ing at least one N-H group capable of condensing with said carboxylic acid
functionality, selected from the group consisting of 4-phenylazoaniline, 4-
aminodiphenylamine, 2-aminobenzimidazole, 3-nitroaniline, 4-(4-
nitrophenylazo)aniline, N-(4-amino-5-methoxy-2-methyl-phenyl)-benzamide,
N-(4-amino-2,5-dimethoxy-phenyl)-benzamide, N-(4-amino-2,5-diethoxy-
15 phenyl)-benzamide, N-(4-amino-phenyl)-benzamide, 4-amino-2-hydroxy-
benzoic acid phenyl ester, and N, N-dimethylphenylenediamine.
2. The composition of claim 1 wherein the diene is selected from the
group consisting of isoprene, piperylene, 1,3-butadiene, and limonene.
3. The composition of claim 1 wherein the diene comprises isoprene.
- 20 4. The composition of claim 1 wherein (a) the copolymer containing
carboxylic acid functionality is prepared by reacting (i) an isobutylene-diene
copolymer having on average about 1 to about 150 moles of reactive carbon-
carbon double bonds per mole of copolymer and about 0.1 to about 2 moles of
said double bonds per 1000 units of \overline{M}_n of the copolymer, with (ii) an α,β -
25 unsaturated carboxylic compound.
5. The composition of claim 1 wherein the α,β -unsaturated carboxylic
compound comprises an acrylic compound, a methacrylic compound, a maleic
compound, a fumaric compound, or an itaconic compound.
6. The composition of claim 1 wherein the α,β -unsaturated carboxylic
30 compound comprises maleic anhydride.
7. The composition of claim 1 wherein the amine component further
comprises an amine having at least two N-H groups capable of condensing with
said carboxylic acid functionality.

8. The composition of claim 7 wherein the amine having at least two N-H groups comprises ethylenediamine, 2,4-diaminotoluene, or phenylenediamine.

9. A lubricant composition comprising a major amount of an oil of lubricating viscosity and a minor amount of the composition of claim 1.

5 10. The lubricant composition of claim 9 further comprising at least one additive selected from the group consisting of detergents, dispersants, viscosity modifiers, pour point depressants, friction modifiers, antioxidants, and antiwear agents.

10 11. The lubricant composition prepared by admixing the components of claim 10.

12. The lubricant composition of claim 9 further comprising a polyisobutene succinimide dispersant having a N:CO ratio of greater than about 1.

13. The lubricant composition of claim 9 further comprising a hydrogenated copolymer of a vinylaromatic monomer with a conjugated polyene

15 14. A process for lubricating an internal combustion engine, comprising supplying thereto the lubricant of claim 9.

15. A process for improving the viscosity index of a lubricating oil composition comprising incorporating into said composition a minor, viscosity-improving amount, of the composition of claim 1.

20 16. A process for reducing soot-induced viscosity increase in a lubricating oil composition comprising incorporating into said composition a minor, viscosity-improving amount, of the composition of claim 1.

17. A concentrate comprising the composition of claim 1 and a concentrate-forming amount of an oil of lubricating viscosity.

25 18. A process for preparing a carboxylic derivative composition, comprising:

(a) reacting

30 (i) an isobutylene-diene copolymer having an \overline{M}_n of about 1000 to about 150,000 and having on average about 0.1 to about 2 units of reactive carbon-carbon double bonds per each 1000 units of \overline{M}_n of the polymer, with

(ii) an α,β -unsaturated carboxylic compound having carboxylic acid functionality or reactive equivalent thereof; and

(b) reacting the product of (a) with an amine component comprising at least one aromatic amine containing at least one N-H group capable of condensing with said carboxylic acid functionality, selected from the group consisting of 4-phenylazoaniline, 4-aminodiphenylamine, 2-aminobenzimidazole, 3-nitroaniline, 4-(4-nitrophenylazo)aniline, N-(4-amino-5-methoxy-2-methyl-phenyl)-benzamide, N-(4-amino-2,5-dimethoxy-phenyl)-benzamide, N-(4-amino-2,5-diethoxy-phenyl)-benzamide, N-(4-amino-phenyl)-benzamide, 4-amino-2-hydroxy-benzoic acid phenyl ester, and N, N-dimethylphenylene-diamine.

10 19. The process of claim 18 wherein the α,β -carboxylic compound is reacted with the isobutylene-diene polymer via a thermal reaction in the substantial absence of added chlorine.

20. The process of claim 18 wherein the α,β -carboxylic compound is reacted with the isobutylene-diene polymer via a radical reaction.

15 21. The process of claim 18 wherein the amine component of (b) further comprises an amine having at least two N-H groups capable of condensing with said carboxylic acid functionality.